

Geosci. Model Dev. Discuss., referee comment RC2  
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## Comment on gmd-2021-143

Anonymous Referee #2

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Referee comment on "A micro-genetic algorithm (GA v1.7.1a) for combinatorial optimization of physics parameterizations in the Weather Research and Forecasting model (v4.0.3) for quantitative precipitation forecast in Korea" by Sojung Park and Seon K. Park, Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-143-RC2>, 2021

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This study used the micro-genetic algorithm and performed a combinatorial optimization of cumulus, microphysics, and planetary boundary layer schemes from the WRF model to improve the quantitative precipitation forecast of a heavy rainfall event in Korea. Five different fitness functions are chosen in terms of Equitable Threat Score to obtain the corresponding best combination of physics schemes for each fitness function. The methodology adopted in this study is explained in great detail, and this method could be very useful to obtain the best combination of physics parameterization schemes with a minimal number of model runs instead of performing an exhaustive search. The manuscript is well written in general, and the results are presented with clarity.

Having said this, I have a few comments on the manuscript.

- The main concern with this work is that the results obtained from this study are very specific to the heavy rainfall event that was considered. Recent studies on parameter estimation, such as Duan et al. (2017) and Di et al. (2018), have performed simulations over multiple heavy rainfall events to obtain a set of optimal parameters to improve the precipitation prediction. Since only a single event was considered in this study, the robustness of the results obtained could not be ascertained. It would be good if the authors could repeat this exercise for a few more heavy rainfall events and present a comprehensive result. The authors should at least try to check how the optimum schemes (OPT-EXP1) are performing for other heavy rainfall events compared to REF and CTL.

Duan, Q., Z. Di, J. Quan, C. Wang, W. Gong, Y. Gan, A. Ye, C. Miao, S. Miao, X. Liang, et al. (2017). Automatic model calibration: A new way to improve numerical weather forecasting. *Bulletin of the American Meteorological Society*, 98(5), 959–970.

Di, Z., Q. Duan, C. Wang, A. Ye, C. Miao, and W. Gong (2018). Assessing the applicability of WRF optimal parameters under the different precipitation simulations in the Greater Beijing Area. *Climate Dynamics*, 50(5-6), 1927–1948.

- In Figures 6 and 9, the Correlation coefficient,  $R$ , was mentioned in the scatter plots. But some values of  $R$  were more than 1. As the values of the correlation coefficient must lie between -1 and +1, the authors should check the calculation of the correlation coefficient.
- In Fig.1, The positions of Yes and No seem to have been swapped in the outer loop. As mentioned in Section 3.2, if the maximum number of generations is exceeded, the algorithm should stop.
- Line 194, "...referred to as OTP." I think the authors meant OPT.
- The language of the manuscript needs to be improved. There are some small spelling and grammatical mistakes in some places. Some of them are: Line 196; "grid" is written as "gird", Lines 235 and 345; "12th" is written as "12nd", Line 236; "4th" is written as "4rd", Line 238; "physics" is written as "physic"